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Determinants of influenza and pertussis vaccination uptake in pregnancy: a multi-centre questionnaire study of pregnant women and healthcare professionals

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Abbreviated title

Improving uptake of maternal vaccination: questionnaire study

Running title

Questionnaire study of maternal vaccination

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Abstract

Introduction

Uptake rates of antenatal vaccination remain suboptimal. Our aims were to determine: (1) the acceptability of routine vaccination among pregnant women, (2) the confidence of maternity healthcare professionals (HCPs) discussing vaccination and (3) HCP opinion regarding the optimum healthcare site for vaccine administration.

Methods

Separate questionnaires for pregnant women and HCPs were distributed within four NHS trusts in South England (July 2017-January 2018).

Results

Responses from 314 pregnant women and 204 HCPs (18% obstetricians, 75% midwives, 7% unidentified) were analysed. Previous/intended uptake of influenza and pertussis vaccination was 78% and 92%, respectively. The commonest reason for declining vaccination was feared side-effects for their child. White British women (79%) were significantly more accepting of influenza (85% vs. 61%, OR 3.25, 95% CI: 1.67-6.32) and pertussis vaccination (96% vs. 83%, OR 4.83, 95% CI: 1.77-13.19) compared with non-white-British women. Among HCPs, 25% were slightly or not-at-all confident discussing vaccination. Obstetricians felt significantly more confident discussing pertussis vaccination than midwives (68% vs. 55% were very/moderately confident, OR 2.05, 95% CI: 1.02-4.12). Among HCPs, 53%, 25% and 16% thought vaccines should be administered in primary care (general practice), community midwifery and in hospital, respectively.

Conclusion

Misconceptions exist regarding safety/efficacy of antenatal vaccination, and framing information towards the child's safety may increase uptake. Education of HCPs is essential, and vaccine promotion should be incorporated into routine antenatal care, with an emphasis on women from ethnic minorities. Administration of vaccines in primary care presents logistical barriers however support for alternative sites appears low among HCPs.

Introduction

Both influenza and pertussis result in severe outcomes for pregnant women and their infants (including respiratory illness and death) [1] [2], and vaccination in pregnancy is an effective means of protection until the period of greatest susceptibility has passed [3–6]. In the UK, influenza and pertussis vaccination have been routinely recommended for use in pregnancy since 2010 and 2012, respectively [7].

Unfortunately, achieving vaccine acceptance among pregnant women and healthcare professionals (HCPs) remains a global challenge [8]. The World Health Organization (WHO) Strategic Advisory Group of Experts on Immunization have called for improved monitoring of vaccine acceptance, and research into the socio-economic determinants of attitudes towards vaccines [9]. The uptake of influenza and pertussis vaccination during pregnancy in England over the September 2016 - January 2017 period was 44.9% and 74.2%, respectively [10] [11]. Pertussis vaccination uptake in the UK has gradually climbed from around 50% since its introduction in 2012, yet influenza vaccine uptake has been relatively static, and remains well below the WHO target of 75% [10]. Furthermore, coverage varies significantly between different regions of the UK, with average uptake approximately 10% and 20% lower in London than in northern England for influenza and pertussis, respectively [9] [11].

Uptake of vaccination could be significantly improved if we are able to fully understand the decision-making processes to acceptance. Furthermore, it is well-acknowledged that encouragement from a familiar HCP significantly improves vaccine acceptance [12] [13], yet few studies have considered the extent to which HCPs feel confident discussing vaccinations with pregnant women, and the associated factors which might influence this. Optimizing the healthcare site of vaccine administration is also an important issue that may have a considerable impact on vaccine uptake, yet few studies have considered the support of HCPs for alternative approaches. In the UK, vaccination is free-of-charge, and is usually provided within primary care (general practice), and is less commonly available within secondary (hospital-based) care. This may present a logistical barrier if it requires women to arrange extra appointments, and more convenient approach might be to routinely administer vaccination at the time of antenatal appointments.

Ours aims were therefore: (1) to identify factors associated with the acceptance of influenza and pertussis vaccinations in pregnancy, (2) to establish the level of confidence among HCPs in discussing vaccination with pregnant women, as well as the factors which might affect this, and (3) to establish the opinion of HCPs as to the optimum healthcare site for vaccine administration.

Methods

Questionnaire design and development

Two separate anonymized questionnaires were developed for pregnant women and maternity HCPs. These were developed with input from a multi-disciplinary study team including obstetricians, pediatricians, health psychologists, and clinical academic trainees. The questionnaires consisted of closed questions and a single free-text box in which participants could add further comments.

The questions analyzed here (see supplementary file) were nested within a larger questionnaire focussing on the attitudes of pregnant women and HCPs to both routine vaccination in pregnancy and to clinical trials of vaccines in pregnancy. The current paper focuses only on the questions relating to routinely recommended vaccines. Pregnant women were asked whether 1) they had/planned to receive influenza and pertussis vaccination and 2) the motivating reasons for accepting or declining these vaccines. Maternity HCPs were asked whether 1) they felt confident providing advice regarding these two vaccines and 2) their opinion regarding the optimal healthcare site of vaccine administration. Ethical approval was granted (reference 17/LO/0537) and the study was registered on ClinicalTrials.gov prior to recruitment (NCT03096574).

Study population and recruitment

The questionnaire for pregnant women was administered to women (aged $\geq$ 16 years at the time of completing the questionnaire) attending for routine antenatal care at four study sites in southern England: University Hospital Southampton NHS Foundation Trust, University Hospitals Bristol NHS Foundation Trust, Oxford University Hospitals NHS Foundation Trust, and St George's University Hospitals NHS Foundation Trust, London. These sites were selected because of their high birth rates (all > 4000 births/year) [14], and by distributing our questionnaire across four hospitals, we attempted to increase the demographic diversity of our study population.

The HCP questionnaire was administered to those working in either midwifery or obstetrics at the same four study sites. It should be noted that routine antenatal care in the UK is usually midwife-led (unless a pregnancy is deemed high-risk), and therefore the majority of potential respondents to our questionnaire were midwives, rather than obstetricians. Recruitment of participants took place from July 2017 to January 2018. Pregnant women were recruited in person via opportunistic sampling at antenatal clinics or wards, and given paper questionnaires to complete. Maternity HCPs were either recruited via email (containing a link to an online questionnaire) or face-to-face by opportunistic sampling, in which case they were also given paper questionnaires. The initial response rate from HCPs was promoted by up to two further email reminders. Participation was voluntary and no financial or other incentive was offered. All participants gave informed consent.

Questionnaire data analysis

Questionnaire data was entered at the lead site (Southampton) into iSurvey (www.isurvey.soton.ac.uk). Statistical analysis was performed using IBM SPSS Version 25. Logistic and ordinal regression analyses were performed for pregnant women and HCP responses, respectively, and adjusted odds ratios (ORs) were calculated. P-values <0.05 were considered as statistically significant. Multicollinearity was examined using the tolerance test and the Variance Inflation Factor (VIF) to ensure variables with a VIF value exceeding 2.5 were not entered into the multivariate regression analysis.

Results

A total of 525 participants completed the questionnaires: 321 pregnant women and 204 HCPs (18% obstetricians, 75% midwives, and 7% unidentified). The numbers of respondents were relatively equally distributed between the four study sites. Eight questionnaires from pregnant women, and five from HCPs, were excluded due to largely incomplete or illegible responses, therefore 513 questionnaires (98%) were included in the analysis. The full characteristics of respondents, including demographic details, are displayed in Table 1.

Responses from pregnant women

Regarding influenza vaccination: of 310 responses, 38% had been vaccinated, 40% were intending to be vaccinated, and 22% were not intending to be vaccinated. Regarding pertussis vaccination: of 302 responses, 56% had been vaccinated, 36% were intending to be vaccinated, and 8% were not intending to be vaccinated. The reasons for declining vaccination are displayed in Figure 1. A similar trend in responses was observed for both vaccines. The most commonly cited reason for declining was concern about possible side effects for their child.

Binary logistic regression analysis (Table 2, supplementary information) demonstrated that women identifying themselves as White British (79% of respondents) were significantly more likely to accept influenza (85% vs. 61%, OR 3.25, 95% confidence interval [CI] 1.67-6.32) and pertussis (96% vs. 83%, OR 4.83, 95% CI 1.77-13.19) vaccination compared to those identifying in all other ethnic groups. In the case of influenza vaccination, study site also had a significant effect, and participants at site B were significantly more likely to accept influenza vaccination than those at site D (91% vs. 64%, OR 4.20, 95% CI 1.47-11.95). Participants' age and whether they had previous children had no significant effect on vaccine uptake. In the qualitative analysis of the free text comments, pregnant women identified further concerns regarding vaccination in pregnancy, including damage to their unborn baby, vaccination being offered too late and insufficient information provided (see supplementary information).

Responses from maternity healthcare professionals

Out of 199 HCPs who responded, they were: extremely (25%), moderately (34%), somewhat (17%), slightly (16%) and not at all (8%) confident providing advice regarding influenza vaccination. For pertussis vaccination, they were: extremely (25%), moderately (32%), somewhat (16%), slightly (15%) and not at all confident (12%). See Figure 2.

Ordinal regression analysis (Table 3, supplementary information) demonstrated that obstetricians were significantly more likely than midwives to feel confident giving advice about the pertussis vaccine (68% vs. 55% were very/moderately confident, OR 2.05, 95% CI 1.02-4.12), however there was no significant difference between either profession for the influenza vaccine. On the other hand, longer experience in maternity care was associated with greater confidence giving advice regarding influenza vaccination, but not pertussis vaccination. Study site was also significantly associated with confidence providing advice for both vaccines, with HCPs from sites B and C being significantly more likely to feel confident than those in site D. Finally, health professional's age and whether or not they had children of their own were not associated with greater confidence in discussing vaccination. No free-text comments from staff relating to influenza/pertussis vaccination were provided for analysis.

With regards to the optimal healthcare site for vaccine administration during pregnancy (Figure 3), approximately one-half (53%) of HCP respondents thought that vaccines should be delivered in the primary care setting as part of general practice, 25% thought vaccines should be delivered in by midwives in the community, and 16% thought vaccines should be delivered in secondary care (at the time of antenatal appointments). The remaining 8% either thought that vaccination should be administered in both general practice and community midwifery services (4%) or in all three locations (4%).

Discussion

Vaccination in pregnancy remains a national and international priority for improving healthcare outcomes. Understanding women's and HCP's opinions and attitudes to vaccine acceptance are important in explaining current vaccination attainment levels. Our aims were to identify factors associated with vaccine acceptance and hesitancy among pregnant women, to establish whether HCPs feel confident discussing vaccination with these women, and to establish where HCPs thought these vaccines should be administered.

Uptake of vaccination among pregnant women

Encouragingly, the acceptance of influenza and pertussis vaccination was high among pregnant women in this study. The most common reasons for vaccine hesitancy were concerns about side effects, and doubts regarding the effectiveness and need for vaccination. Perception of possible harm is commonly cited as the primary reason for vaccine refusal among previous studies [12] [15], and women are usually more concerned about potential risks to their child's health than their own [16]. Clearly, important misconceptions still exist regarding the safety of vaccines, including the presence of 'toxins' such as thimerosal (a mercury-containing preservative removed from childhood vaccines in 2001) that was proposed in 2005 to be associated with neurologic conditions, including autism [17]. We recommend that vaccine advocacy should emphasise the safety and efficacy of vaccination, specifically towards protection of the baby. Furthermore, accessible alternatives to face-to-face counseling that been successfully used in the past have included social media and webcasts [18] [19], mobile phone text messages (such as Text4baby) [20] [21] and smart phone apps (such as MatImms [22]).

Another important finding was that pregnant women of ethnic minorities were significantly less likely to accept vaccination than those identifying as 'White British'. Previous research has similarly demonstrated lower vaccine acceptance among these groups [23–25], and these findings highlight the importance of taking into account possible cultural/religious and language barriers when counselling these women and producing educational materials. The underlying reasons for the difference in vaccine attitudes between ethnic groups remains a significant gap in our knowledge, and future studies in this specific area are needed. Interestingly, we did not find any significant effect of age or having children already in our study, however younger age has been shown to be associated with lower uptake in some previous studies [23] [26]. Study site had no effect on pertussis vaccine acceptance however there was significantly higher influenza vaccine acceptance among pregnant women at site B. These results may be skewed by the recruitment season of this site, however, as recruitment here was all undertaken entirely during the influenza vaccination season (which runs from September to February).

Confidence of healthcare professionals and optimal healthcare site for vaccine administration

Very few previous studies [27] have investigated to what extent HCPs feel confident discussing vaccination with pregnant women. This is despite the fact that pregnant women consider their HCP their most trusted source of information, and encouragement from them has been shown to increase intention to receive vaccination by up to 20 times [13] [12]. Conversely, a lack of knowledge of the indications and benefits of vaccination among HCPs has been identified as a barrier to implementation of vaccination recommendations [28]. Among HCPs in our study, a significant proportion were not confident providing advice to

pregnant women. Confidence also varied significantly by study site, suggesting that there is a potential risk of health inequalities based on differing levels of vaccine confidence and recommendations across the South of England. Further education of multidisciplinary HCPs is essential, and individual barriers to active promotion of these vaccines need to be identified and reduced. Individual sites should aim to establish areas of low confidence within their own working body and push to incorporate active promotion of vaccination into routine antenatal care. Also, while it should be noted that obstetricians, and those with more experience in maternity care, felt more confident giving advice about the pertussis and influenza vaccines, respectively, we suggest that education should not be aimed solely at a particular profession, or those new to maternity care.

Finally, optimizing the healthcare site for vaccine administration is an important and topical issue which may have a considerable impact on vaccine uptake. In the UK, vaccination in pregnancy is usually provided in the primary care setting (within general practice), yet this presents a logistical barrier as it normally requires women to arrange extra primary care appointments. A more convenient and efficient approach might be to routinely offer and administer vaccination at the time of hospital antenatal appointments (such as the fetal anomaly scan at around 20 week's gestation), either by incorporating vaccination directly into these clinics, or providing adjacent vaccination clinics, which women are invited to visit immediately before or after their regular antenatal appointment [29–31]. Previous studies have demonstrated that vaccinating in secondary care may indeed improve uptake [29–31], yet support for this approach appeared to be low (16%) among HCPs surveyed in this study. A lack of staff, lack of a suitable setting and resources, concerns regarding appropriate financial reimbursement, and lack of confidence with vaccine discussion, have all been identified as potential barriers to this approach by HCPs in previous studies [30–33]. Potential solutions include employing dedicated vaccination staff (including vaccination specialist midwives) and improving vaccine education (as discussed above). Further pragmatic and/or qualitative research is also required to establish the feasibility and effectiveness of this approach, and to establish facilitators and barriers to its acceptance among both pregnant women and HCPs.

Strengths and limitations

This study had significant numbers of respondents, and by distributing our questionnaire at four hospitals in southern England we attempted to maximize the demographic diversity of our study population. That said, the responses to the questionnaire cannot be taken as representative of all pregnant women and maternity HCPs. Reported actual/intended vaccine uptake was higher among our questionnaire respondents than national reports of vaccine uptake, and this may limit the generalisability of our study findings. All of our respondents were recruited from antenatal clinics at tertiary hospitals, and therefore it is possible that our sample was missing subsets of the population that tend to be more anti-vaccination. Future studies would therefore benefit from including a greater number of study sites over a wider geographic area, and recruiting from different types of sites (including smaller non-tertiary hospitals and primary care) and perhaps utilizing online recruitment via popular websites and social media.

Another limitation is that we relied upon self-reported vaccination status/intention, and there is therefore potential reporting bias in our estimations, which may have been improved by verification of women's medical records following delivery; however recent evidence does suggest that self-reported intention correlates well with actual uptake of vaccination [34 35]. Finally, the number of pregnant women/HCPs approached, and the number who declined

participation (as well as their reasons for doing so) was not recorded, and we are therefore unable to report this.

Conclusions

Whilst the high acceptance of vaccination among respondents in this study was encouraging, misconceptions still exist regarding vaccine safety and efficacy. Further education of multidisciplinary HCPs is essential, and active vaccine promotion needs to be incorporated into routine antenatal care, with a particular emphasis on women from ethnic minorities.

Figures

Figure 1: Reasons why the surveyed pregnant women did not intend to receive influenza or pertussis vaccination in pregnancy

Figure 2: Healthcare professionals' confidence providing advice to pregnant women regarding influenza (A) and pertussis (B) vaccination in pregnancy

Figure 3: Healthcare professionals' opinions regarding the optimal healthcare site at which vaccines in pregnancy should be delivered

Tables

Table 1: Characteristics of the respondents to questionnaires (pregnant women and healthcare professionals)

Table 2 [Supplementary information]: Logistic regression analysis of factors predicting pregnant women's intention to receive vaccination

Table 3 [Supplementary information]: Ordinal regression analysis of factors predicting healthcare professionals' confidence in providing advice regarding vaccination in pregnancy

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Author Contributions

CW drafted the manuscript. All authors contributed to questionnaire design and critically revised the manuscript. CW, AC, JM, EK, RM, KB, PH, AK, AF, MS, TV, TN, MC and CJ were involved in study set up and data collection at the participating sites. CW, TN and CJ performed the data analysis. CJ conceived the study and was the chief investigator. All authors approved the final version of the manuscript.

Conflict of Interests Statement

CW, AC, JM, KB, PH, AK, AF, MS and CJ are investigators for clinical trials done on behalf of their respective institutions, sponsored by various vaccine manufacturers, but receive no personal funding for these activities. All other authors report no potential conflicts of interest.

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Clinical trial registration

The questionnaire study was registered on ClinicalTrials.gov prior to recruitment (NCT03096574).

Ethical approval

Ethical approval was granted from the West London & GTAC NHS Research Ethics Committee (reference 17/LO/0537) on 6th April 2017.

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Characteristic	Pregnant women, n=314	Healthcare professionals, n=199
Age		
16-24	34 (11%)	
25-30	107 (34%)	
31-35	92 (29%)	
36-40	58 (19%)	
41-45	13 (4%)	
46+	0 (0%)	
Gestation (weeks)		
<12	8 (2%)	
12-16	37 (12%)	
17-20	31 (10%)	
21-30	55 (18%)	
31-36	93 (30%)	
>37	76 (24%)	
Study site		
A	88 (28%)	43 (22%)
B	77 (25%)	53 (27%)
C	79 (25%)	61 (31%)
D	70 (22%)	42 (21%)
Ethnicity		
Asian (British, Indian, Pakistani, Bangladeshi, Chinese, other)	25 (8%)	4 (2%)
Black (British, African, Caribbean, other)	17 (5%)	4 (2%)
White (British, Irish, other)	248 (79%)	175 (88%)
Mixed (Caribbean, African, Asian, other)	11 (4%)	6 (3%)
Other ethnic group (Arab, other)	3 (1%)	0 (0%)
Did not want to say	1 (0.3%)	1 (1%)
No response	10 (3%)	9 (5%)
Has children		
No	142 (45%)	72 (36%)
Yes	172 (55%)	127 (64%)
Profession		
Obstetrics		37 (19%)
Midwifery		151 (76%)
No response		11 (6%)
Midwifery seniority		
Band 5 (newly-qualified midwife)		8 (4%)
Band 6 (junior midwife)		84 (42%)
Band 7 (senior midwife)		46 (23%)
Band 8 (midwifery manager)		8 (4%)
No response		5 (3%)
Obstetrician seniority		
Specialty training years 1-3 (or equivalent)		8 (22%)
Specialty training years 4-6 (or equivalent)		6 (16%)
Specialty training years 7-8 (or equivalent)		6 (16%)
Consultant		17 (46%)
Time spent working in maternity care (years)		
<2		17 (9%)
2-5		29 (15%)
6-10		37 (19%)
11-15		20 (10%)
16-20		26 (13%)
>21		62 (31%)
No response		8 (4%)

Table 1: Characteristics of the respondents to questionnaires (pregnant women and maternity healthcare professionals)

Variable	Number who had previously received/were intending to receive influenza vaccination (%)	Adjusted odds ratio (95% Confidence interval)	Number who had previously received/were intending to receive pertussis vaccination (%)	Adjusted odds ratio (95% Confidence interval)
Ethnicity				
White British	182/213 (85%)	3.25 (1.67-6.32) ***	203/212 (96%)	4.83 (1.77-13.19) **
Non-White British	51/84 (61%)	1.00 for reference	70/84 (83%)	1.00 for reference
Study site				
Site A	67/85 (79%)	1.36 (0.61-3.04)	73/81 (90%)	0.47 (0.14-1.62)
Site B	68/75 (91%)	4.20 (1.47-11.95) **	67/72 (93%)	0.91 (0.21-3.89)
Site C	58/74 (78%)	1.38 (0.58-3.30)	72/76 (95%)	1.22 (0.26-5.67)
Site D	40/63 (64%)	1.00 for reference	61/67 (91%)	1.00 for reference
Age				
16-24	26/32 (81%)	1.19 (0.40-3.58)	28/29 (97%)	1.96 (0.22-17.66)
25-35	152/188 (81%)	1.24 (0.62-2.49)	173/186 (93%)	1.12 (0.40-3.14)
36-45	49/68 (72%)	1.00 for reference	64/71 (90%)	1.00 for reference
Previous children				
Yes	127/163 (78%)	0.82 (0.44-1.53)	145/160 (91%)	0.47 (0.17-1.32)
No	106/134 (79%)	1.00 for reference	128/136 (94%)	1.00 for reference

*= p<0.05; **= p<0.01; ***= p<0.001;

Table 2: Logistic regression analysis of factors predicting pregnant women's intention to receive/previous receipt of vaccination

Variable	Number who were very or moderately confident providing advice about influenza vaccination (%)	Adjusted odds ratio (95% Confidence interval)	Number who were very or moderately confident providing advice about pertussis vaccination (%)	Adjusted odds ratio (95% Confidence interval)
Professional group				
Obstetrics	24/37 (65%)	2.00 (0.90-4.03)	25/37 (68%)	2.05 (1.02-4.12) *
Midwifery	90/151 (60%)	1.00 for reference	83/151 (55%)	1.00 for reference
Time working in maternity care				
21+ years	42/62 (68%)	3.88 (1.29-11.68) *	36/62 (58%)	1.72 (0.58-5.09)
11-20 years	32/46 (70%)	4.02 (1.33-12.15) *	30/46 (65%)	1.98 (0.67-5.87)
2-10 years	34/66 (52%)	2.83 (1.05-7.66) *	36/66 (55%)	2.22 (0.83-5.95)
<2 years	6/17 (35%)	1.00 for reference	7/17 (41%)	1.00 for reference
Study site				
A	24/43 (56%)	1.27 (0.54-2.99)	20/43 (47%)	1.09 (0.47-2.57)
B	39/53 (74%)	5.05 (2.12-12.01) ***	26/53 (49%)	4.68 (1.98-11.05) ***
C	41/61 (67%)	2.44 (1.13-5.29) *	42/61 (69%)	2.46 (1.14-5.30) *
D	15/42 (36%)	1.00 for reference	16/42 (38%)	1.00 for reference
Has their own children				
Yes	84/127 (66%)	1.23 (0.62-2.42)	76/127 (60%)	1.21 (0.52-3.63)
No	35/72 (49%)	1.00 for reference	38/72 (53%)	1.00 for reference
Ethnicity				
White British	108/175 (62%)	1.75 (0.66-4.66)	101/175 (58%)	1.37 (0.52-3.63)
Non-White British	11/24 (46%)	1.00 for reference	13/24 (54%)	1.00 for reference

*= p<0.05; **= p<0.01; ***= p<0.001

Table 3: Ordinal regression analysis of factors predicting healthcare professionals' confidence in providing advice regarding vaccination in pregnancy

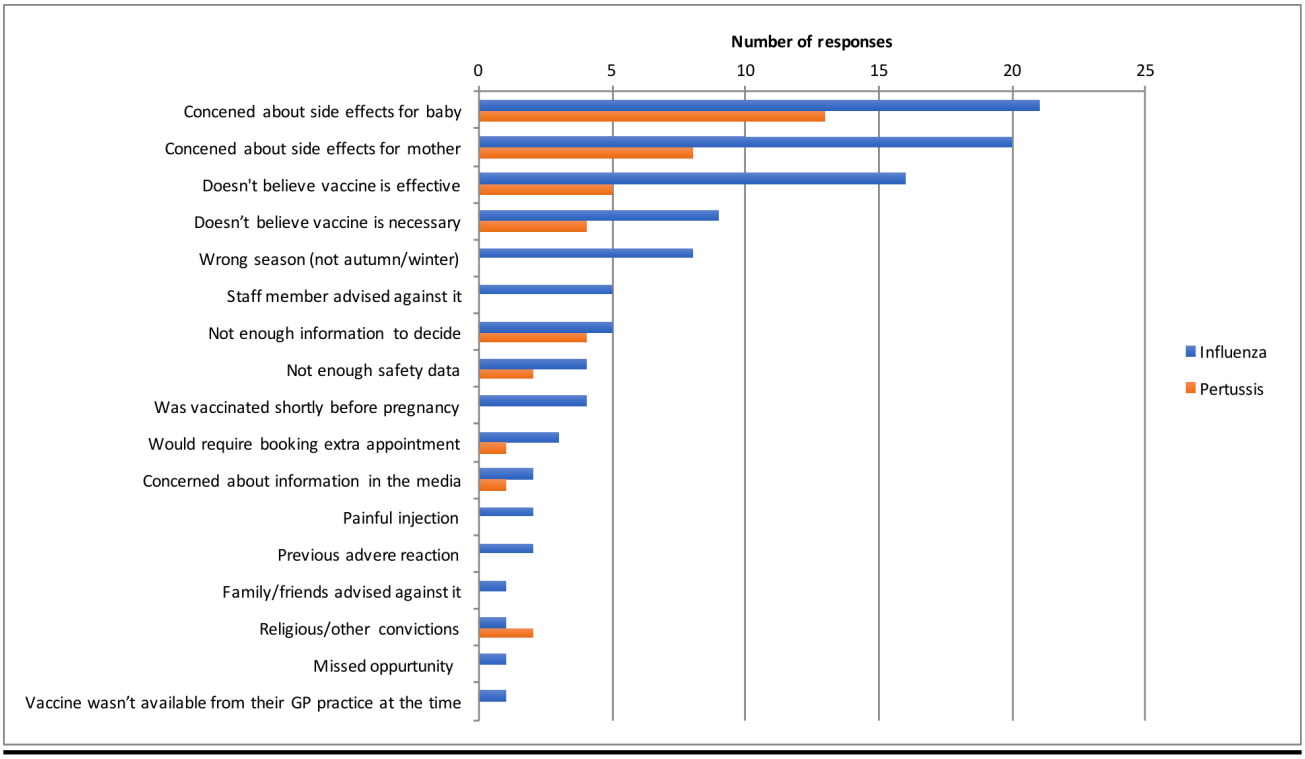

Figure 1: Reasons why the surveyed pregnant women did not intend to receive influenza or pertussis vaccination in pregnancy

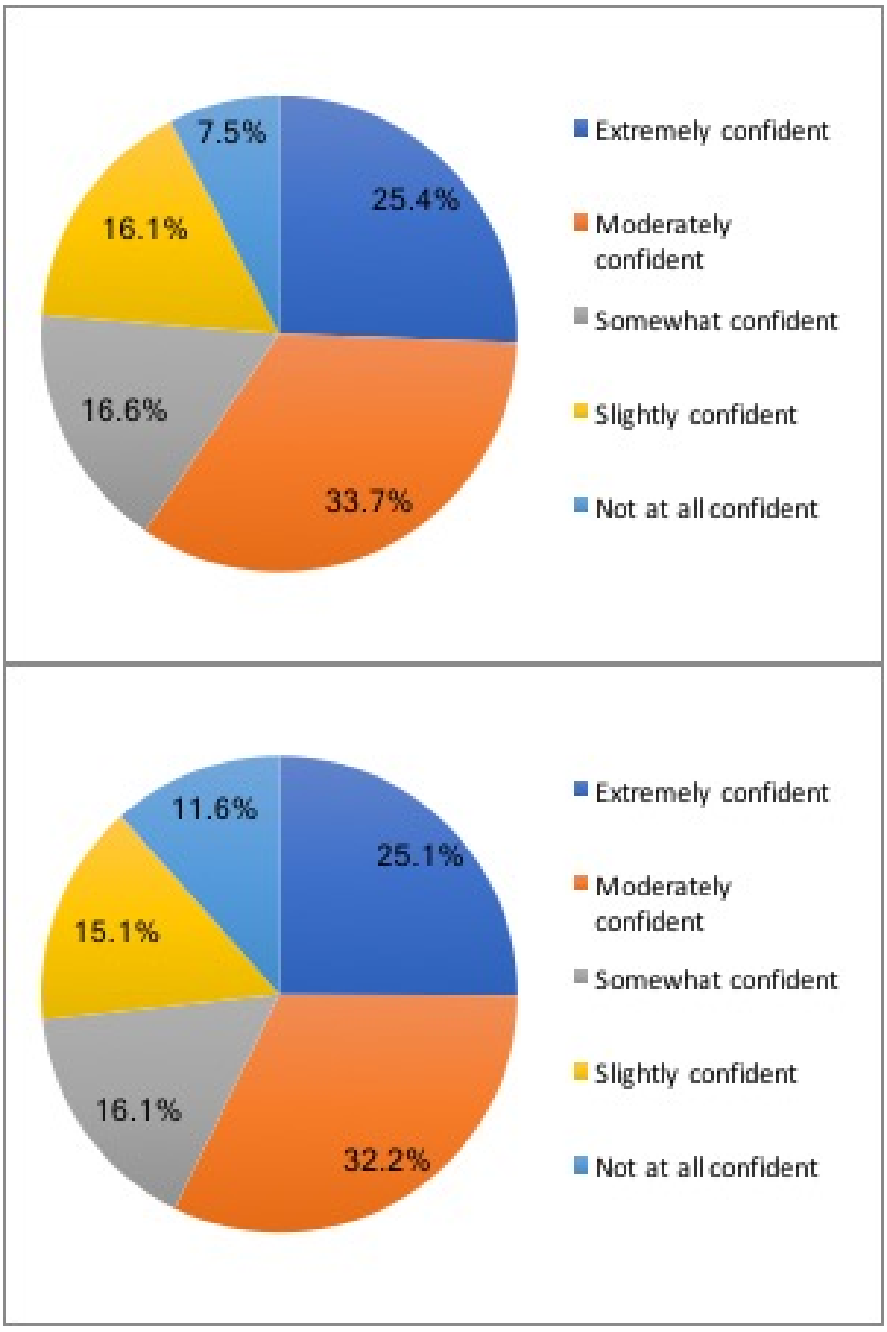

Figure 2: Healthcare professionals' confidence providing advice to pregnant women regarding influenza (A) and pertussis (B) vaccination in pregnancy

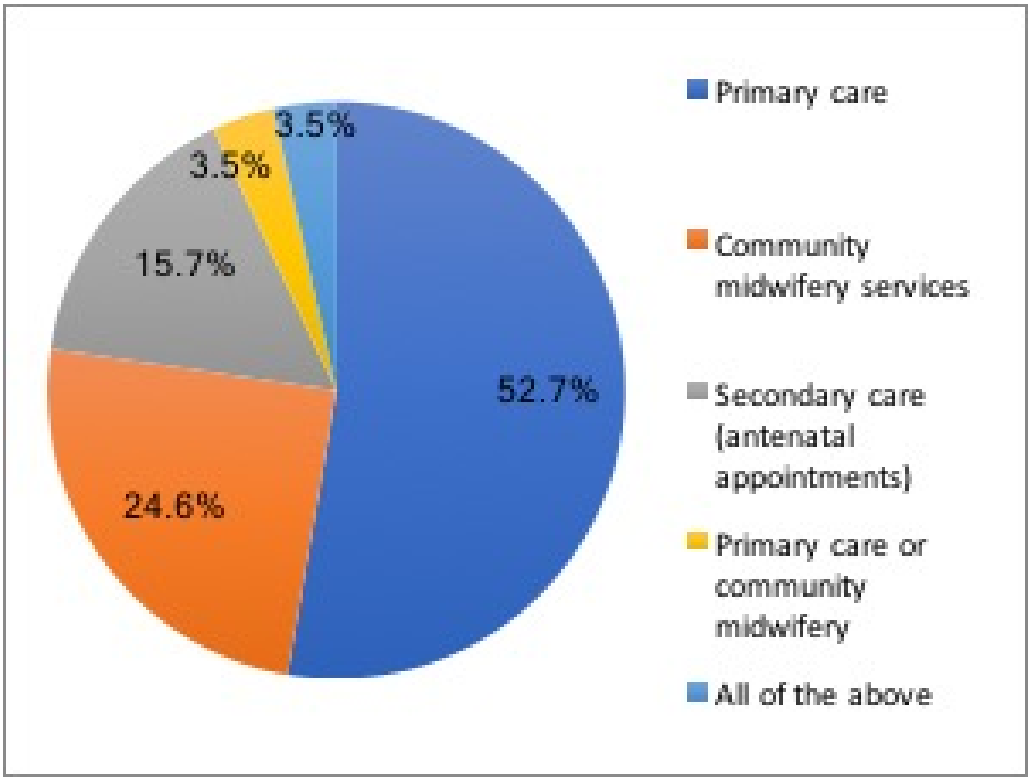

Figure 3: Healthcare professionals' opinions regarding the optimal healthcare site at which vaccines in pregnancy should be delivered

Supplementary information

1. Questions for pregnant women analyzed in this study

(1) Have you received either of the following vaccines in this pregnancy?

Flu (influenza) ☐ Yes ☐ No

Whooping cough (pertussis) ☐ Yes ☐ No

(1a) If no, why have you not yet received these vaccines?

	For flu (influenza)?	For whooping cough(pertussis)?
I don't intend to receive the vaccine	☐	☐
I haven't been offered the vaccine yet	☐	☐
I haven't got round to getting the vaccine yet	☐	☐

Other (please specify)……..

(1b) If you don't intend to receive these vaccines in this pregnancy, please specify the reasons why. T*ick as many apply:*

	For flu (influenza)?	**For pertussis (whooping cough)?**
I worry that the injection might be painful	☐	☐
My midwife did not advise it	☐	☐
My obstetrician did not advise it	☐	☐
My GP did not advise it	☐	☐
My family/friends advised against it	☐	☐
I don't believe the vaccine is effective	☐	☐
I worry about potential side effects for my baby	☐	☐
I worry about potential side effects for me	☐	☐
Vaccination was not offered to me	☐	☐
There is not enough safety data	☐	☐
I don't have enough information to decide	☐	☐
I am concerned about information in the media	☐	☐
I don't want to attend extra hospital/GP visits	☐	☐
Religious or other convictions	☐	☐

Other (please specify):

……..

(2) How old are you in years?

16-24 ☐ 25-30 ☐ 31-35 ☐ 36-40 ☐ 41-45 ☐ 46+ ☐

(3) How many weeks pregnant are you?

Less than 12 ☐ 12-16 ☐ 17-20 ☐ 21-30 ☐ 31-36 ☐ 37+ ☐

(4) To what ethnic group do you feel you belong? (Please circle)

White

- English / Welsh / Scottish / Northern Irish / British Irish
- Gypsy or Irish Traveller
- Other (please specify) ……..

Black / African / Caribbean / Black British

- African
- Caribbean
- Other (please specify)……..

Mixed/Multiple ethnic groups
- White and Black Caribbean
- White and Black African
- White and Asian
- Other (please specify) ……..

Other ethnic group
- Arab
- Other (please specify)……

Asian / Asian British
- Indian
- Pakistani
- Bangladeshi
- Chinese
- Other (please specify) ……

I'd prefer not to say

(5) Have you had any children before?

☐ Yes.

If yes, how many?.....

What are their ages?

Child 1: Less than 1 ☐ 1-5 ☐ 6-10 ☐ 11-16 ☐ 17+ ☐

Child 2: Less than 1 ☐ 1-5 ☐ 6-10 ☐ 11-16 ☐ 17+ ☐

Child 3: Less than 1 ☐ 1-5 ☐ 6-10 ☐ 11-16 ☐ 17+ ☐

☐ No

(6) <u>Optional</u>: Do you have any comments or concerns about any of the issues raised in the questionnaire?

……
……
……
……
……
……

2. Questions for maternity healthcare professionals analyzed in this study

(1) How confident would you feel about providing advice regarding the flu (influenza) vaccine to women during pregnancy?

☐ Not at all confident
☐ Slightly confident
☐ Somewhat confident
☐ Moderately confident
☐ Extremely confident

(2) How confident would you feel about providing advice regarding the whooping cough (pertussis) vaccine to women during pregnancy?

☐ Not at all confident
☐ Slightly confident
☐ Somewhat confident
☐ Moderately confident
☐ Extremely confident

(3) In your opinion, where should these vaccines be delivered to pregnant women?

☐ Primary care (GP practice)
☐ Midwifery services (Community services)

☐ Secondary care at time of antenatal scans or appointments
☐ Other (please specify)……..

(4) Which healthcare professional group do you belong to?
☐ Obstetrics
☐ Midwifery
☐ Other (please state) ……

(5) How long have you worked in maternity care?
☐ Under 2 years
☐ 2-5 years
☐ 6-10 years
☐ 11-15 years
☐ 16-20 years
☐ 21+ years

(6) What is your grade?
1. Midwifery/nursing staff
Band 4 ☐ Band 5 ☐ Band 6 ☐ Band 7 ☐ Band 8 ☐ Band 9 ☐
2. Obstetricians
ST 1-3 (or equivalent) ☐ ST 4-6 (or equivalent) ☐ ST 7-8 (or equivalent) ☐ Consultant ☐

(7) Have you had any children before?
☐ Yes.
If yes, how many?.....
What are their ages?
Child 1: Less than 1 ☐ 1-5 ☐ 6-10 ☐ 11-16 ☐ 17+ ☐
Child 2: Less than 1 ☐ 1-5 ☐ 6-10 ☐ 11-16 ☐ 17+ ☐
Child 3: Less than 1 ☐ 1-5 ☐ 6-10 ☐ 11-16 ☐ 17+ ☐
Child 4: Less than 1 ☐ 1-5 ☐ 6-10 ☐ 11-16 ☐ 17+ ☐

☐ No

(8) To what ethnic group do you feel you belong? (Please circle)

White
- English / Welsh / Scottish / Northern Irish / British Irish
- Gypsy or Irish Traveller
- Other (please specify) ……..

Black / African / Caribbean / Black British
- African
- Caribbean
- Other (please specify)……..

Mixed/Multiple ethnic groups
- White and Black Caribbean
- White and Black African
- White and Asian
- Other (please specify) ……..

Other ethnic group
- Arab
- Other (please specify)……

Asian / Asian British
- Indian
- Pakistani
- Bangladeshi
- Chinese
- Other (please specify) ……

I'd prefer not to say

(9) *Optional:* Do you have any comments or concerns about vaccination or vaccine research studies during pregnancy?
……
……

.....
.....
.....
.....

3. Free text comments (all received from pregnant women)

“Many vaccines contain unsafe levels of mercury, in some cases are produced on human tissue (DNA) and contain various other toxins. I believe a baby is born with a perfect immune system which takes up to three years to fully develop and it’s not healthy injecting a perfectly healthy child with chemicals and toxins (mercury)”

“We were not offered the whooping cough [vaccine] until much later on in the pregnancy – close to it being too late. No flu jab offered – we would have done so otherwise.”

“I would like the opportunity to ask more questions and have more information before agreeing to vaccination”